

1 Introduction¹

In the science fiction movie Minority Report, director Steven Spielberg shows us Washington D.C. in the year 2054. By then, computing is ubiquitous. As the movie's hero, crime fighter John Anderton, moves through the streets of the city, he is continuously recognised on the basis of individual biometric data, such as iris scans. In the shopping mall, holographic shop assistants and interactive posters address John on a first-name basis, whispering irresistible offers based on his preferences and previous purchases. They are, in other words, using personal information about John that must be stored somewhere in a huge database. His user profile data are thus used to personalise the communication and target him as a 'group-of-one'.

By 2054, murder has been eliminated. Three genetically altered humans (called precogs) are able to prevent murders because they are clairvoyant. They foresee the assault and know the name of the victim and the time of the crime before it actually happens. Crime fighters then go out and prevent the crime happening. In this fictitious world, individual behaviour is not only monitored and influenced but even prevented before it has actually occurred.

The world described in Philip K. Dick's novel (1956) and Steven Spielberg's 2002 screen adaptation is in some regards unrealistic. However, it is realistic in the sense that organisations are currently collecting data on individuals with the aim of using this information, which is stored in a user profile, to adapt communication, and to predict and influence behaviour. This report examines the possibilities and restrictions of user profiling. It is one of the deliverables for the 'Alter Ego project'.

The 'Alter Ego Project' of the Telematica Institute addresses how cross-domain user profiles can simplify and optimise the benefits of 'intelligent' products and services. It answers, moreover, research questions from three different perspectives: the business perspective, the technical perspective and the usage perception perspective. The focus of this report is on the behavioural aspects of both the business² and the user perspective on user profiling.

The following is a state-of-the-art (SOTA) report. It contains an overview of the most relevant organisational and behavioural aspects regarding user profiling. According to the concept plan for the Alter Ego Project (Telematica Instituut & IBM, 2004a), this document can be marked as deliverable D1.9 containing the State of the Art of cross-domain user profiling from an organisational perspective.

First this chapter will define the terms 'User Profile' and 'User Profiling': what are they and what information can be stored inside such a profile? Next, three possible aims of user profiling are presented: what are the benefits of this Alter Ego project? And are these benefits equally important to both users and organisations? Next, the framework of

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² The original project plan uses the term 'business' perspective. This seems to suggest that only businesses and private organisations have an interest in cross-domain user profiling. However, non-profit and public organisations, such as government agencies, also have an interest in user profiling. Therefore the more general term 'organisation' has been used in this document.

analysis of this report will be presented. Finally, this chapter will give a preview of the remaining chapters of this state-of-the-art report.

1.1 User profiles

People use all kinds of ICT applications in order to support and execute the many activities that constitute their daily lives. In one of the Alter Ego work documents, this is described as follows: 'Increased connectivity, decreasing data storage capacity cost, improved multimodal interfaces, smart objects in heterogeneous environments, mean that technology is increasingly intertwined with activities in our daily life, be it work or leisure. But the complexity of services and their user interfaces also leads to an under-use of functionality. We could even say that daily life is becoming more and more complex *thanks to* and *despite* the increasing use of "intelligent" products and services.'

(Telematica Instituut & IBM, 2004b, p. 11)

Especially ICT applications that are aimed at providing or supporting electronic services require data on individual users to achieve their function. To give a few examples: an online store needs to have individual user data such as an address to deliver the goods that are purchased. The city administration, which is approached by an impaired citizen requesting a special parking permit near her house, must have at its disposal both data about her address and about the nature and severity of the impairment. Such data are often provided by the individual user but can be stored for re-use by the organisation.

In the past, the purchase or acquisition of services or products required that individuals were in contact with many different organisations, at different times and at different locations, providing each with the data they needed. Nowadays, since many of these services are offered electronically, the actual contact between the organisation and the person seeking a service or product is often realised via the individual's personal computer (be it a desktop computer or a more mobile application such as a phone or PDA). Personal communication devices act as single access point to a variety of organisations, services and products.

From the user's perspective, the potential benefit of a single access point is not realised when the organisations treat each contact as if it were a first-time contact, requiring individual data as if they were not already provided on earlier occasions. Also, from the user's perspective, single access is particularly efficient for contacts with sets of organisations or departments within organisations which in the user's opinion have a common goal or interest in the user. For example, for an impaired citizen who is moving to a new hometown, the request for a special parking permit is part of a 'scenario' of moving from one town to another. That scenario also includes activities such as registering with the municipality and finding out about waste collection times at the new address. Although these services might be offered by different departments or even by different organisations, the citizen will perceive them as part of one 'event' and might easily become frustrated if having to perform the entire scenario, and provide the specific data, over and over again. Re-use of data collected or provided on earlier occasions strengthens the relationship between user and organisation. A good user-experience during the contact will lead to (more) satisfaction about the application used, e.g. the e-commerce or the site, and more importantly, to a (more) positive image of the organisation behind the application.

When organisations have collected data about the individuals they are in contact with, they can make 'intelligent' use thereof for the planning and adaptation of further

messages, information or actions with or for the individual. In that case, the organisations use the data about current user characteristics or behaviour to adapt information and communication to the targeted individual and to predict future behaviour. For example, once the aforementioned citizen's new hometown 'knows' that she is impaired, the local administration might predict that she will also be interested in receiving information about the municipal support organisations for impaired citizens and provide her with it without her explicit request.

In earlier reports in the Alter Ego project, a user profile is defined as follows:

A user profile is a structured description of a user, containing an identifier and user-related information such as preferences (Telematica Instituut & IBM, 2004b, p. 14). In their definition of a user profile, Cremers, Lindenberg and Neerincx (2002, p. 2) mention some additional features of user profiles. They take the needs and previous behaviour of users (in the context of the ICT application) into account and define a user profile as:

A data record describing the user with his characteristics, abilities and needs and previous interaction experiences.

In this report, we will extend the definition even further and thus define the term user profile as follows:

A user profile is a (structured) data record, containing user-related information including identifiers, characteristics, abilities, needs and interests, preferences, traits and previous behaviour in contexts that are relevant to predicting and influencing future behaviour.

Some categories of user-related information concern stable, unalterable 'properties' of the user, such as name, age and gender. Other categories relate to properties that can easily alter over time (e.g. developing new preferences or abilities) and context (e.g. having a need for information during international travel, but not during national travel).

A simple manifestation of a user profile could contain information as shown in table 1 (below), which was derived from the Alter Ego Focus and Refinement document (Telematica Instituut & IBM, 2004a, p. 5). These types of information can be referred to as 'user-related information'.

I Am	→	ID: name, social security number, iris scan, ...
I Am+	→	Me: personality, religion, astrology, medical, ...
I Prefer	→	Preferences: music, art, news, food, travel, ...
I Like	→	Interests: painting, scuba diving, WW I, ...
I Have	→	Circumstances: children, a job, a car, mobile,
I Want	→	Goals: education, career, social life,
I Do	→	Behaviour: sports, work, music, ...
I Know	→	Expertises: quantum physics, flowers, ...
...	→	...

Figure 1.1: Information types in user profiles

The process of using user profiles, and the underlying activities of creating, maintaining and updating user profiles, is what we will refer to as user profiling.

In the literature related to user profiling, different terms are used, such as personalisation, adaptation, customisation, tailoring, targeting and segmentation. Various authors use the same term for different things, or use different terms for the same thing. In this report, we will work with the following definitions for terms related to user profiling.

Segmentation

Segmentation is the process of dividing a population into groups (segments) on the basis of similarities in user-related information of individuals.

Adaptation

Adaptation is the process of adapting the appearance and content of messages and media to segments or individuals.

Targeting

Targeting is the aiming at specific segments.

Tailoring (personalisation, customisation)

Tailoring is the aiming at individuals

In our opinion, tailoring, personalisation and customisation are the same. We prefer to use the term tailoring in this report, which has a background in health communication. It might, however, occur that the terms personalisation or customisation are used alternatively. In some domains, e.g. marketing communication, the terms personalisation and customisation are more common. In other fields, such as product and interface development, the term customisation is often used. Therefore we might use the terms personalisation and customisation as synonyms for tailoring when we describe research from these domains.

In our view, the concepts defined above are linked. Adaptation can be divided into targeting and tailoring, with targeting aiming at segments and tailoring aiming at individuals. Also between the segments and the individual there is a connection. An individual can be seen as a 'segment of one' and is the ultimate form of segmentation. On the other hand, there is the 'one segment'. We refer to the process of creating the segments as segmentation. The relationships between the concepts are shown in figure 1.2.

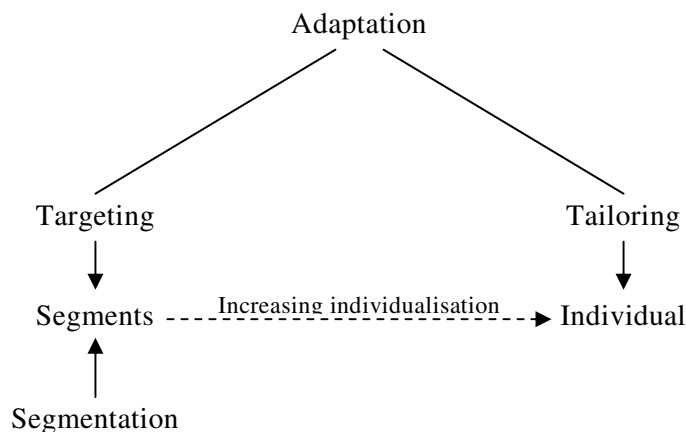


Figure 1.2; Relationships between adaptation and related concepts

1.2 Aims of user profiling

User profiling is a process that requires a long-term commitment from organisations and users. The kinds of user data collected and used imply that user profiles are regularly, if not continuously, updated with new user data. Why would organisations and users bother to make such a long-standing commitment?

On a general level, user profiling can serve three interrelated aims:

Aim 1:

Making the communication between organisation and user more efficient (minimal option) and more effective.

Aim 2:

In addition to making the communication more efficient and effective, predicting the behaviour of users.

Aim 3:

In addition to making the communication more efficient and effective and on the basis of predicted user behaviour, influencing users in order to make them demonstrate desired behaviour (maximal option).

Each successive aim requires more detailed information about the user and presupposes that more far-reaching and ‘intelligent’ conclusions can be drawn from the user data compiled in the user profile. This also means that each aim requires a greater level of adaptation. The adaptation level of aim 1 will mostly be on the level of interfaces and communication infrastructures. In the successive aims (2 and 3) the level of adaptation will shift increasingly towards the content. More detailed information is needed to change behaviour than to improve communications. To change behaviour, intentions and attitudes, information types concerning behaviour (I do) and beliefs (I believe) are needed.

From the organisation’s perspective, user profiling is a means to achieve organisational goals and/or to perform organisational activities in a more efficient and effective way. What kinds of organisational goals are to be achieved depends on the nature of the organisation. For a retail organisation, for example, user profiling would be a means to improve customer relationships, consequently sell more products and ultimately make more profit. For a healthcare organisation, user profiling would be a means to provide more effective health information, hence create better patient compliance with a treatment and ultimately offer better care.

When we combine the three aims of user profiling for organisational goals, the following potential benefits for organisations can be discerned:

Aim of user profiling	Potential benefits for organisation
Making communication 1a. more efficient 1b. more effective	Cheaper, better communication with users; improved relationship with users
Predicting user behaviour	Better match between organisational goals, products and services on the one hand and user needs, interests and preferences on the other
Influencing user behaviour	Changing individuals' behaviour to create a better match between organisational goals, products and services on the one hand and (future) user behaviour on the other (e.g. purchasing behaviour, compliance with a medical treatment, etc.)

Figure 1.4: Potential benefits of user profiling for organisations

However, user profiling can only be effective when the user allows organisations to collect user data and when the work involved with creating, using and maintaining the user profile is perceived as worth the effort. What are the potential benefits of user profiling from a user perspective?

Communication efficiency and effectiveness will most likely be an aim of users. When communication is made more efficient and effective, users may benefit from an easier, better and more pleasant communication with the organisation. Besides this, the relationship with the organisation might improve because people are recognised as individuals.

The second aim also has potential benefits to individual users. When an organisation gains insight into a user's behaviour, the user might benefit from the better match between his or her individual needs or interests and the products and services offered by the organisation.

The third and final aim has probably the least benefits to individual users. When an organisation tries to influence the behaviour of the user, most likely organisational goals and purposes are predominant. A commercial organisation might try to influence buying behaviour whereas a governmental organisation might try to influence compliance with the law. This might not always be in the interest of the user. Therefore, it is quite possible that this aim will evoke the most resistance among users.

From this general analysis, it may already have become evident that the benefits of user profiling to organisations are the greatest with the aim 3 type of profiling, whereas for users the benefits of aim 1 profiling are the most obvious. This discrepancy between user interests and organisation interests in user profiling is one of the main issues influencing acceptance.

1.3 Framework of analysis

User profiling is described as a means for realising organisational goals (such as selling products, delivering particular services or collecting taxes) with more success than when it is not applied.

The user profile data are stored and maintained in a system, for example a database, which we will call the user profile system. Data from the user profile system feeds into the ICT application through which the organisation communicates and transacts with its clients, citizens or customers. On the basis of the data collected in the user profile system, the application can either present adapted 'content' (such as information, products and services) to the user, or communicate the content in ways adapted to what is known about the user. The actual behaviour that the user displays while using the ICT application (e.g. visiting particular pages or making a specific purchase) can be collected and stored as user data in the user profile system.

The relationship between organisation, user, application and user profile system is depicted in figure 1.5, below.

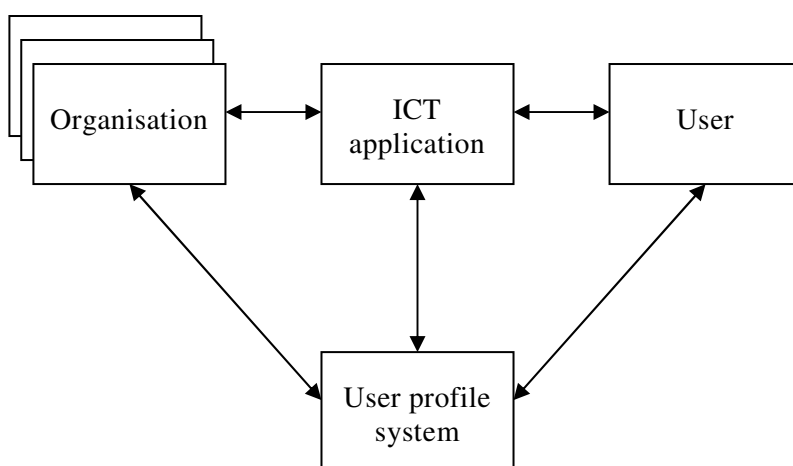


Figure 1.5: The framework of user profiling

Organisation

The first element in the model is the organisation, which here can also stand for a connected group of organisations or various departments within an organisation. The organisation is the party that takes the initiative to use a user profile system to achieve specific organisational goals in its contacts with an individual. The organisation might be a public or private sector organisation; groups of organisations might be exclusively public or exclusively private or mixed private/public (cross-sector), for example when welfare organisations (public) and insurance companies (private) both contribute to and make use of the user profile system. Groups of organisations might also be acting in the same domain (e.g. they are all healthcare organisations) or in different domains (cross-domain), for example when healthcare organisations and retailers both contribute to and make use of the user profile.

The organisation's character and goals greatly influence the possibilities and limitations of user profiling and user profiles. In chapter 2, user profiling will be described from an organisational perspective in more detail.

User

The second element in the model is the user. We use the term 'user' throughout this report for any individual interacting with an organisation via an ICT application. However, it is important to note that these individuals will never see themselves as 'users' of the application. Use of the application is not an end in itself but for the users it is a means to achieve other goals which they are pursuing through their contact with the organisation. So, in their own perspective, they are for example customers of an online supermarket, or citizens who have to pay their taxes, or holiday guests trying to book an apartment, or patients in need of treatment. Users interact with organisations in many different roles and contexts of use.

Not every citizen, client or customer is willing and able to become and remain a user of the ICT application of the organisation. Chapter 6 will focus on the crucial conditions for the acceptance, initial and continued use of ICT applications and user profile systems.

ICT Application

The third element in the model is the ICT application that the organisation is using in its dealings with the individual. When groups of organisations (or departments within an organisation) are dealing with the user via one application, it often has the character of a portal site. For example, many online banking sites have recently started to present themselves as a portal through which the customers can manage both their savings and stock accounts (two different areas within the bank). For the users, being addressed through one portal rather than via many different applications is already beneficial and efficient. For the organisations, however, the possibilities to collaborate across departments, organisations, domains and sectors are often limited, and building up such a collaborative enterprise takes a lot of effort. The obstacles in the exchange of information and in the collaboration between various organisations or departments of organisations are described in chapter 2. In separate reports within the Alter Ego project, the technical, legal and ethical implications, limitations and conditions for exchanging (personal) information between systems are discussed.

User profile system

The fourth element is the user profile system, the system that contains the user data and offers facilities to collect, store, maintain and update user data (Pine II, Peppers, & Rogers, 1995). Most of this report is about what kinds of user data can be collected, and what goals can or cannot be achieved with user profile data.

In figure 1.5 (above), the four elements (organisation, ICT application, user, user profile system) are connected with arrows, showing the relationship between the elements.

Organisations ↔ ICT application

Organisations use ICT applications to achieve their organisational goals. Especially when different organisations, or different departments within an organisation, have to work together to communicate via one ICT application with the user, all kinds of obstacles have to be cleared. In a separate report, the technical problems that organisations meet when integrating their services in a portal will be described (Jansen, forthcoming). Chapter 2 of this report describes the aims and obstacles of organisations using portals from an organisational perspective.

ICT application ↔ user

Users communicate and interact with organisations via the ICT application that the organisation uses to achieve its organisational goals. They communicate with

organisations to fulfil their own goals and interests. The success of the communication and interaction not only depends on the user experience with the application itself (human computer interaction, system trust) but also on how the user perceives the organisation behind the application.

Although ICT is always involved in the interaction between user and organisation, it is important to realise that not all interaction between the user and the organisation goes directly via the ICT application. It is quite possible that the user profile system is used by organisations to improve the communication and interaction with their users via traditional communication means, such as telephone, traditional ‘snail’ mail or face-to-face contact. One example is a tailored direct mail. These direct mails *seem* personal because they address readers on an own-name basis. This is an example of a tailored message based on a user profile. In this case the ICT application is not directly involved (the organisation communicates on paper) but is used behind the scenes to generate the tailored letter.

User profile → ICT application, ICT application → User profile

The user profile system is a separate entity from the ICT application. The ICT application uses the user-related information stored in the user profile system for a tailored (re-)action directed at a specific user.

At the same time, the actual behaviour of users in the ICT application, or user-related information that is provided by the user in the ICT application can be fed into the user profile system to update or extend the user profile.

Organisation ↔ User profile

The organisation creates, maintains (or acquires) and uses user profiles in order to achieve organisational goals. Besides the user-related information that feeds into the user profile system through the ICT application, the organisation might also have other information at its disposal that can be added to the user profile. An important issue is who ‘owns’ and controls the user profile and the information it contains. We can safely assume that at least part of the user-related information is collected and provided by the organisation, which does not necessarily mean that the organisation is the *only* party that collects or controls it.

User ↔ User profile

Directly or indirectly, the user will provide the user-related information to be stored in the user profile. Again, the issue of who ‘owns’ and controls the user profile is essential.

1.4 User profiling in its context

User profiling is occurring in a context that to a large extent defines the effects that it can have, both on organisations and users. That context is merely indicated here and will be discussed in as far as it will affect the effectiveness for organisations and users.

From our point of view, the technology used or to be developed for realising user profiling is a context issue. It concerns numerous issues that we just indicate here, albeit a non-exhaustive list:

- the possibilities and limitations of creating, storing and maintaining large sets of information on virtually every individual;
- issues on combining snippets of user-related information that are collected and stored in various distributed systems;

- issues related to ‘intelligent’ reasoning with user-related information to predict future behaviour of use;
- issues of customising an application’s content or presentation to an individual user.

User profiling will also be subject to laws governing the use and protection of personal information (such as the *Wet Bescherming Persoonsgegevens* – the Dutch Data Protection Act) and the privacy rights of citizens, customers and clients. Hence part of the influential context of user profiling is the legal context.

Furthermore, a number of societal issues surround the development and use of user profiles, such as views held in society at large on, for example, security, advertising, ICT use and ethical issues in general. These views can differ broadly among individuals, are subject to change over time, and can be affected by events that are experienced by the individual user or that are extensively covered by the media.

1.5 Conditions for effectiveness of user profiling

The objective of each of the following chapters is to identify the factors that influence the feasibility and effectiveness of user profiling and user profiles. On a general level, there are a number of prerequisites for effectiveness.

On the organisation’s side, user profiling must have a demonstrable return on investment (ROI). The organisation must be able to prove to itself that user profiling helps to achieve its goals better, or that it helps to communicate and interact with users in a more efficient and effective way. If that return on investment cannot be demonstrated, the organisation will stop pursuing user profiling in the longer term.

From the users’ point of view, access, trust and acceptance are prerequisites for user profiling. First of all, users must be able and willing to access the ICT applications of organisations and the user profile system. Chapter 6 addresses these issues. Secondly, users must trust not only the user profile system and the ICT application but also the intentions and goals of the organisation using the user profile. Chapter 7 is devoted to the important issue of trust. Finally, once access and trust are ensured, the users must accept the use of the user profiles, both initially and in the longer term. Acceptance of user profiling is, among others, influenced by:

- Control: who controls the user-centred data?
- Presentation and interface of the ICT application and the user profile system: do both systems look credible and reliable?
- Motivation: what are the benefits and rewards for users?
- Context issues: is the system technically secure? Are privacy issues well taken care of by law?

If the user does not trust or accept user profiling, it will fail. Chapter 8 focuses on the issue of acceptance.

1.6 Preview

Chapter 2 of this report will discuss user profiling from the organisation’s perspective. Chapter 2 will focus on characteristics of the organisations and discuss motives for and obstacles to organisations to engage in user Profiling. Chapter 2 will moreover discuss the differences between organisations that have consequences for the applicability of user profiling.

Chapters 3, 4 and 5 all describe one of the three aims presented in chapter 1. Chapter 3 will discuss communication efficiency and effectiveness, thereby focussing on the question how communication can be adapted to individual users. Chapter 4 will focus on the inference and prediction of behaviour, paying special attention to techniques of segmentation of populations. Chapter 5 discusses the third aim of user profiling and theories of behavioural change and the tailoring of messages to change individual behaviour.

Chapters 6-8 of this report address conditions for the effectiveness of user profiling; access, trust and acceptance. Chapter 6 will discuss the first condition for effective use of user profiling: access. Its focus is on the user characteristics that determine whether or not an individual can and wants to make use of user profiles (access). As user profiling is closely related to ICT, attention is also paid to ICT access. Chapter 7 will discuss the factor trust - an important condition for the effectiveness of user profiling. If a user does not trust the organisation or the technology used, there is little chance that user profiling will become a success. Chapter 8 will discuss the acceptance of user profiling, which in order to be a success, must be accepted. This acceptance is threefold: the acceptance of the necessary technology, the acceptance of the fact a user profile is being developed, maintained and used, and the acceptance of the organisation.

Chapter 9, the final chapter, will summarise the most important findings of the SOTA, it gives recommendations to organizations engaging in user profiling that will help enhance the success of user profiling. Finally, chapter 9 gives suggestions for future research on the field of user profiling.